

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (original): A method for producing a substrate having a carbon-doped titanium oxide layer, characterized by directly striking a combustion flame of a gas consisting essentially of a hydrocarbon, against a surface of a substrate having at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, to heat-treat the surface of the substrate such that a surface temperature of the substrate is 900 to 1,500°C; or by heat-treating the surface of the substrate in a combustion gas atmosphere of a gas consisting essentially of a hydrocarbon such that the surface temperature of the substrate is 900 to 1,500°C, thereby forming a carbon-doped titanium oxide layer.
2. (original): A method for producing a substrate having a carbon-doped titanium oxide layer, characterized by heat-treating a surface of a substrate, which has at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, in a gas atmosphere consisting essentially of a hydrocarbon such that a surface temperature of the substrate is 900 to 1,500°C, thereby forming a carbon-doped titanium oxide layer.
3. (original): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 1 ~~or 2~~, characterized in that the substrate, which has at least a surface layer

comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, is composed, as a whole, of one of titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide.

4. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim ~~1, 2 or 3~~ 1, characterized in that the substrate, which has at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, is composed of a surface portion forming layer and a core material, and materials for the surface portion forming layer and the core material are different.

5. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 4~~ claim 1, characterized in that the substrate, which has at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, is powdery.

6. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 5~~ claim 1, characterized in that the titanium alloy is Ti-6Al-4V, Ti-6Al-6V-2Sn, Ti-6Al-2Sn-4Zr-6Mo, Ti-10V-2Fe-3Al, Ti-7Al-4Mo, Ti-5Al-2.5Sn, Ti-6Al-5Zr-0.5Mo-0.2Si, Ti-5.5Al-3.5Sn-3Zr-0.3Mo-1Nb-0.3Si, Ti-8Al-1Mo-1V, Ti-6Al-2Sn-4Zr-2Mo, Ti-5Al-2Sn-2Zr-4Mo-4Cr, Ti-11.5Mo-6Zr-4.5Sn, Ti-15V-3Cr-3Al-3Sn, Ti-15Mo-5Zr-3Al, Ti-15Mo-5Zr, or Ti-13V-11Cr-3Al.

7. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 6~~ claim 1, characterized in that the gas consisting essentially of a hydrocarbon contains 30% or more by volume of an unsaturated hydrocarbon.

8. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 7~~ claim 1, characterized in that the gas consisting essentially of a hydrocarbon contains 50% or more by volume of acetylene.

9. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 8~~ claim 1, characterized by forming the carbon-doped titanium oxide layer containing 0.3 to 15 at% of carbon.

10. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 9~~ claim 1, characterized by forming the carbon-doped titanium oxide layer having Vickers hardness of 300 or higher.

11. (original): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 10, characterized by forming the carbon-doped titanium oxide layer having Vickers hardness of 1,000 or higher.

12. (currently amended): The method for producing a substrate having a carbon-doped titanium oxide layer according to ~~any one of claims 1 to 11~~ claim 1, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

13. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized in that the substrate, which has at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, is composed, as a whole, of one of titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide.

14. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized in that the substrate, which has at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, is composed of a surface portion forming layer and a core material, and materials for the surface portion forming layer and the core material are different.

15. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according claim 2, characterized in that the substrate, which has at least a surface layer comprising titanium, a titanium alloy, a titanium alloy oxide, or titanium oxide, is powdery.

16. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized in that the titanium alloy is Ti-6Al-4V, Ti-6Al-6V-2Sn, Ti-

6Al-2Sn-4Zr-6Mo, Ti-10V-2Fe-3Al, Ti-7Al-4Mo, Ti-5Al-2.5Sn, Ti-6Al-5Zr-0.5Mo-0.2Si, Ti-5.5Al-3.5Sn-3Zr-0.3Mo-1Nb-0.3Si, Ti-8Al-1Mo-1V, Ti-6Al-2Sn-4Zr-2Mo, Ti-5Al-2Sn-2Zr-4Mo-4Cr, Ti-11.5Mo-6Zr-4.5Sn, Ti-15V-3Cr-3Al-3Sn, Ti-15Mo-5Zr-3Al, Ti-15Mo-5Zr, or Ti-13V-11Cr-3Al.

17. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized in that the gas consisting essentially of a hydrocarbon contains 30% or more by volume of an unsaturated hydrocarbon.

18. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized in that the gas consisting essentially of a hydrocarbon contains 50% or more by volume of acetylene.

19. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized by forming the carbon-doped titanium oxide layer containing 0.3 to 15 at% of carbon.

20. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized by forming the carbon-doped titanium oxide layer having Vickers hardness of 300 or higher.

21. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 20, characterized by forming the carbon-doped titanium oxide layer having Vickers hardness of 1,000 or higher.

22. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 2, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

23. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 3, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

24. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 13, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

25. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 4, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

26. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 14, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

27. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 6, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

28. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 16, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

29. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 9, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.

30. (new): The method for producing a substrate having a carbon-doped titanium oxide layer according to claim 19, characterized by forming the carbon-doped titanium oxide layer functioning as a visible light responding photocatalyst.